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Forest Health Protection

Pacific Southwest Region
Northeastern California Shared Service Area

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To: Mike Reynolds, Park Superintendent, Lava Beds National Monument

Subject: Tree mortality and insect activity associated with prescribed fire (FHP Report NE12-07)

At the request of Nancy Nordensten, Chief of Resources Management, Lava Beds National Monument (LBNM), Danny Cluck, Forest Health Protection (FHP) Entomologist, visited prescribed fire units in the southwest corner of LBNM on October 16, 2012. The objective of this visit was to evaluate the levels of fire injury to conifers, note any insect activity and discuss factors that are associated with elevated post-fire tree mortality. Recommendations provided in this report will assist in the formulation of burn prescriptions that are intended to reduce fuels without causing high levels of tree injury or mortality. Nancy Nordensten, Syndy Zerr (Fire Management Officer, LBNM) and John Donahue (Fuels Specialist, LBNM) accompanied me in the field.

Description of the project area

Lava Beds NM is located approximately 8 miles south of Tulelake, CA along the Modoc and Siskiyou county border (T45/46N, R3/4E). The elevation ranges from 4,050 – 5,650 feet with annual precipitation between 10 and 20 inches. Forest types range from western juniper (*Juniperus occidentalis*) in the lower elevation and more eastern locations transitioning to ponderosa pine (*Pinus ponderosa*) at the higher elevation and more western locations. Individual Jeffrey pine (*Pinus jeffreyi*), white fir (*Abies concolor*) and sugar pine (*Pinus lambertiana*) are also found mixed with ponderosa pine and western juniper in some locations. Recent prescribed burns were conducted as part of the LBNM plan to reduce fuels and maintain fire as an essential ecological disturbance.

General observations

Valentine (Fall 2009) and Crescent Butte (Fall 2011) Prescribed Burn Units: Both of these units consist of western juniper and ponderosa pine mixed with native brush species. Ponderosa (and Jeffrey) pine are growing at the edge of their range in these units and are irregularly dispersed

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on the landscape. Fire injuries to pines included both crown and bole scorching leading to various levels of branch and cambium kill. In general, trees that sustained higher levels of fire injury were subsequently attacked by bark and/or woodboring beetles. Specifically, evidence of red turpentine beetle (*Dendroctonus valens*), *Ips* spp. (pine engraver beetles) and/or flatheaded woodboring beetles (Family: Cerambycidae) was observed on fire-injured pines that had recently died. No evidence was found that the recent ponderosa pine mortality was associated with mountain pine beetle (*Dendroctonus ponderosae*) or western pine beetle (*Dendroctonus brevicomis*).

Several recently deceased pines did not appear to have sustained fire injuries that would normally lead to subsequent attack by bark and/or woodboring beetles. Many trees that were attacked by flatheaded woodborers (most likely California flatheaded borer, *Phaenops californica*) had low levels of crown scorch and limited cambium kill.

Sequoia pitch moth (*Synanthedon sequoiae*) activity was also observed on several pines in the Crescent Butte unit but was not related to fire-injury and not causing significant damage.

***Hidden Valley Unit (proposed for Fall 2012)*:** This nearly pure ponderosa pine unit is up slope and in a slightly higher precipitation zone than the Valentine and Crescent Butte Units. Stocking levels and tree sizes are variable and western dwarf mistletoe (*Arceuthobium campylopodum*) is infesting a few trees (both overstory and understory pines). This unit was previously burned in 1989 and again in 1996 resulting in a few large diameter trees (>25" dbh) sustaining basal injuries associated with duff and litter consumption around their base. Some of these trees have since died or are in a state of decline as indicated by thinning crowns. One faded smaller diameter pine was recently killed by mountain pine beetle. Most of the younger trees appear to be in a healthy condition as indicated by needle retention and leader growth. Duff and litter levels around the remaining large diameter trees are generally low as a result of previous burns.

Recent bark beetle activity

FHP aerial detection surveys mapped low levels of scattered ponderosa pine mortality within LBNM in 2010 and 2012, all associated with the Valentine prescribed fire unit. Aerial detection surveys also mapped more landscape scale ponderosa pine mortality south of LBMN on the Modoc National Forest in 2010, 2011 and 2012. This mortality was associated with both western and mountain pine beetle activity. A few 150 to 200 acre areas were mapped each of the past three years (rate = 1 dead tree/acre) within 2 miles of the Hidden Valley unit. This level of activity is considered to be slightly higher than normal and related to overstocked stand conditions and recent drought. If you would like to view the aerial survey spatial data please visit the FHP website: http://www.fs.usda.gov/detail/r5/forest-grasslandhealth/?cid=fsbdev3_046696

Post-fire beetle activity and tree mortality in the Valentine and Crescent Butte Units

The amount of post-fire beetle activity and associated tree mortality depends on many factors such as the timing of the fire, the level of fire injury, the level of insect activity in the area prior to the fire, stand characteristics and precipitation. For the Valentine and Crescent Butte Units, woodboring beetles were the most frequently encountered insect in fire-injured trees that had recently died or were currently fading. Woodboring beetles typically attack trees that are dead or

dying as most species do not have the ability to overcome a healthy tree's resin defenses. The fact that many lightly fire-injured trees, trees that would not be expected to die based on their injuries alone, were attacked by woodboring beetles indicates that these trees were under additional stress such as drought. These trees, which are growing on the drier edge of their range, did not appear to be able to produce a resin response to initial woodborer attacks (e.g. resin streamers on the bole and resin pockets under the bark near feeding larvae). Overstocking does not appear to be an issue in this area.

The only bark beetle activity that was observed in these units was *Ips* spp. and red turpentine beetle in fire-injured pines. *Ips* spp. are similar to woodborers in this situation in that they are prone to attacking severely weakened trees. Red turpentine beetles often attack fire injured trees but are not consistently associated with tree mortality. Since no western or mountain pine beetle activity was observed, there is little chance for these more aggressive, tree killing bark beetles to build up and spread to other burned or unburned pines.

Woodborers will continue to attack severely weakened trees of all species, including western juniper, over the next few years in both the Valentine and Crescent Butte units. Since elevated levels of bark beetle activity exist in areas to the south, some trees in these units may be attacked and killed by western and/or mountain pine beetles. However, this activity will most likely be limited to fire injured trees and not cause excessive mortality. Post-fire bark and woodboring beetle activity generally persists for about five years with the majority of activity occurring over the first three years. These predictions assume that LBNM receives near normal precipitation over this time period.

Considerations for the Hidden Valley Unit

The proposed prescribed burn plan in the Hidden Valley Unit should consider the current dry conditions, the slightly elevated bark beetle activity to the south and the fuel levels and arrangement within the stand. Since this is a high-value stand within the LBNM, care should be taken to minimize fire-injury by burning on the low end of the prescription and manipulating excessive fuels around individual large trees and within dense stands of smaller trees. Raking duff and litter out away from the boles of large diameter trees will help insure limited bole injury and cambium kill. This is especially important for trees with > 8" of compacted duff and litter at their base and trees with old fire scars that could ignite and burn deep into the bole. Manipulation of fuels should also include removal of down logs from the base of trees to prevent severe bole injury. As with any prescribed burn, there will be variability in burn severity and some areas could burn hotter and create more fire injury than anticipated. Should this occur within the Hidden Valley unit, some post-fire bark and woodboring beetle activity should be expected. However, this activity should be limited to trees that sustain more moderate to high severity fire-injury. Again, this assumes near normal precipitation for the area post-burn.

If the goal is to have very limited or no tree mortality within the Hidden Valley area, than pre-treatment of duff and litter (and ladder fuels) should be considered around any and all trees that are desired to be retained. Especially trees > 8" dbh (i.e., trees large enough to be susceptible to bark beetle attacks) combined with burning on the cooler end of the prescription. Alternatively, this

prescribed burn could be delayed until normal precipitation returns the area and bark beetle activity returns to background levels in surrounding areas.

If you have any questions regarding this report and/or need additional information please contact me at 530-252-6431.

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